INSECTS OF MICRONESIA

Diptera: Coelopidae (Phycodromidae)[1]

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This is the first report of the occurrence of the family Coelopidae in the Pacific region other than the subarctic, subantarctic, and New Zealand areas. The United States Office of Naval Research, the Pacific Science Board (National Research Council), the National Science Foundation, and Bishop Museum have made this survey and the publication of the results possible. Field research was aided by a contract between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences, NR 160-175. The drawings were prepared by Marian S. Adachi, University of Hawaii.

The coelopids are moderate-sized, conspicuously hairy flies which breed in kelp, and perhaps in other seaweed, washed up on the shore. The adults can be collected in large numbers by sweeping seaweed along the beaches. The group is almost restricted in distribution to cold and temperate regions of the world. Aldrich (1929, U. S. Nat. Mus., Proc. **76**: 1) writing of North American species of *Coelopa s. l.* says "... all of the spp. appear to breed in the kelps and are found only on seashores where seaweeds of this group are washed up." The discovery of a species in the western Caroline Islands greatly extends the known range of the family.

The members of this family, as defined by Hendel [1928, Tierwelt Deutschlands **11** (2): 89], are characterized by having the prelabrum produced; the genae swollen (bulging); the body depressed, the postvertical bristles well developed and convergent; the tibiae with preapical dorsal bristles, the median pair crossed; the subcostal vein complete, and the costa not broken. Malloch (1933, Ann. Mag. Nat. Hist. X, **11**: 340) points out several important characters not listed by Hendel. For instance, the haired prosternal plate, the presence of very short setulae on the posterior lower angle of the hypopleura, the bristling of the pleura, and the structure of the apical tarsal segment and its appendages. He limits the family to those species which have the prosternum well separated from the sclerotized propleura by a well-defined sunken mem-

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branous strip and the epistome in side view projected well beyond the level of the anterior margin of the frons. The prelabrum is well developed and the central part of the epistome is above the level of the vibrissal angles so that the former is usually withdrawn in the space between the angles though visible from the sides.

The species at hand fits in *Coelopa* Meigen *s. l.* in that the metasternum is haired and the mesopleura are bare. The generic concepts of this group are somewhat confused in the literature. Malloch (1933, Ann. Mag. Nat. Hist. X, **11**: 342) considers *Fucomyia* Haliday a subgenus of *Coelopa,* distinguished by the radial vein being bare below, rather than with setae at the base below as in typical *Coelopa.* Hennig (1937, IN Lindner, Die Fliegen der Palaearktischen Region **52**: 17) considers *Fucomyia* a distinct genus, separated from *Coelopa s. str.* by having bristles (macrochaetae) on the genae, abdomen, and femora; no presutural bristles; and the underside of the radial vein bare. Hennig does not agree with Malloch's concept, saying that separating *Fucomyia* and *Coelopa* on the basis of the presence or absence of setae on the underside of the radial vein is not satisfactory. *Coelopa s. str.,* as defined by Hennig, includes those species which have no distinct bristles on the genae, abdomen, and legs but instead are clothed with long, fine hair. The genotype also has presutural bristles and setae at the base of the radial vein below; other included species lack these two characters. The species from Micronesia would fit in *Coelopa* (*Fucomyia*) in Malloch's key by having the radial vein bare. Seguy (1940, Rev. d'Ent. **7**: 157) also follows this concept. In his discussion, however, Malloch says the presutural bristles are lacking in *Fucomyia* and present in *Coelopa* (*Coelopa*). Our species has well-developed presuturals and fits Hennig's concept of *Coelopa s. str.* since the vestiture of the genae, abdomen, and legs is made up of long fine hair. The species shows tremendous variation in the amount of pilosity present, the larger specimens are densely haired and the smaller ones are very sparsely haired. Aldrich (1929, U. S. Nat. Mus., Proc. **76**: 1) points out that these variations are typical of these flies. He writes: "... in all cases the larger [specimens] are more spinose or pilose, the striking vestiture being reduced with the size until it becomes inconspicuous." Aldrich adds (p. 2), "*Fucomyia* is undoubtedly a synonym of *Coelopa. Fucomyia* has bristly legs, while in *Coelopa* they are pilose; but this applies only to males and is best developed in the larger males, smaller ones showing much less difference, and females showing hardly a specific difference, much less a generic one."

In light of the evident variability of the chaetotaxy and the fact that the species at hand borderlines *Coelopa* and *Fucomyia,* I believe it best to follow Malloch in treating *Fucomyia* as a subgenus. It is obvious that *Coelopa s. l.* needs to be thoroughly revised and the taxonomy based upon more reliable concepts. The genotype of *Coelopa, C. pilipes* Haliday, and *C. vanduzeei* Cres-

son are apparently the only species known which have setae on the radial vein. *C. pilipes* has setae on the underside at the base of the vein, and *C. vanduzeei* has several hairs on the apical part [type of *Coelopa (Neocoelopa)* Malloch]. Furthermore, the genotype and the species from Micronesia are apparently the only *Coelopa s. l.* known to have presutural bristles. Following Hennig's concepts, *Coelopa (Fucomyia)* may be monotypic; *C. frigida* (Fabricus) is the only species definitely known to belong here.

I arrange the species of *Coelopa* as follows:

COELOPA (COELOPA) MEIGEN, 1830

Coelopa aequatorialis Bezzi, 1892, Mus. Civ. Stor. Nat. Genova, Ann. **12**: 194 (Africa). Possibly a synonym of *C. pilipes* Haliday, according to Hennig (1937, IN Lindner, Die Fliegen der Palaearktischen Region **52**: 19).

Coelopa africana Malloch, 1933, Ann. Mag. Nat. Hist. X, **11**: 343 (Africa). Described as *Coelopa (Fucomyia)* but fits Hennig's concept of *Coelopa s. str.*

Coelopa alluaudi Seguy, 1940, Rev. d'Ent. **7**: 157 (Madagascar). Related to *C. africana* Malloch.

Coelopa curvipes Hutton, 1902, New Zealand Inst., Trans. **34**: 172 (New Zealand and Auckland Islands). Placed in *Coelopa (Fucomyia)* by Malloch but lacks bristles on the body and legs.

Coelopa dasypoda Bezzi, 1908, Jena Denkschr. Med. Ges. **13**: 191 (South Africa). Placed in *Coelopa* by Hennig.

Coelopa macquariensis Womersley, 1937, Australasian Antarctic Exped., Sci. Rept. B, **4**: 72 (Macquarie Island, south Pacific). Described as *Coelopa (Fucomyia)* but fits Hennig's concept of *Coelopa s. str.*

Coelopa palauensis n. sp., described below.

Coelopa pilipes Haliday, 1839, Nat. Hist., Ann. **2**: 186. New name for *C. frigida* Meigen, 1830, *nec* Fabricius, 1805 (Europe and North Africa). The genotype of *Coelopa*. Synonymy: ? *C. nitidula* Loew, 1862, *nec* Zetterstedt, 1847; ? *C. aequatorialis* Bezzi, 1892, *Hippobosca marina* Montagu "mss.?" cited as synonym by Walker, 1849.

Coelopa pilipes var. *brevipilosa* Mercier, 1921, Soc. Ent. Belgique, Ann. **61**: 163 (Europe and North Africa).

Coelopa stejnegeri Aldrich, 1929, U. S. Nat. Mus., Proc. **76**: 5 (Pribilof and Commander Islands, north Pacific). Placed in *Coelopa (Fucomyia)* by Malloch because of the bare radial vein but placed in *Coelopa s. str.* by Hennig because of the lack of bristles on the head, abdomen, and legs. Synonymy: *Coelopa frigida* Coquillett, 1899, *nec* Fabricius, 1805; *C. eximia* Malloch, 1923, *nec* Stenhammer, 1855; *C. parvula* Cole, 1921, *nec* Haliday, 1833; *C. nitidula* Coquillett, 1899, *nec* Zetterstedt, 1847; and *C. nigrovillosa* Hendel, 1932.

COELOPA (FUCOMYIA) HALIDAY, 1838

Coelopa frigida (Fabricius), 1805, Syst. Antliatorum, 307. The genotype (Palaearctic and Nearctic Regions). Synonymy: *C. simplex* Haliday, 1833.

Coelopa frigida var. *gravis* Haliday, 1833, Ent. Mag. **1**: 167 (north Atlantic coasts). Placed as a variety by Hennig. Synonyms: *C. eximia* Stenhammer, 1855 and *C. parvula* Johnson, 1925, *nec* Haliday, 1833.

Coelopa frigida var. *nebularum* Aldrich, 1929, U. S. Nat. Mus., Proc. **76**: 5 (Bering Sea region). Placed as a variety by Hennig. Synonyms: *C. frigida* Coquillett, 1899, *nec* Fabricius, 1895; *C. nitidula* Coquillett, 1900, *nec* Zetterstedt, 1847; and *C. frigida* Hendel, 1932.

Coelopa frigida var. *parvula* Haliday, 1839, Nat. Hist., Ann. **2**: 186 (northern Europe and America, subarctic region). Placed as a variety by Hennig. Synonym: *C. nitidula* Zetterstedt, 1847.

COELOPA (NEOCOELOPA) MALLOCH, 1933

Coelopa vanduzeei Cresson, 1914, Ent. News **25**: 457 (west coast U. S.). The genotype and only known species. Synonym: *C. frigida* Cole, 1912, *nec* Fabricius, 1805.

OTHER COMBINATIONS

Coelopa monstruosa Hutton, 1901, New Zealand Inst., Trans. **33**: 80, is the genotype of *Chaetocoelopa* Malloch (1933, Ann. Mag. Nat. Hist. X, **11**: 350). *C. littoralis* Hutton, 1881 (Cat. New Zealand Dipt., 69) also belongs in this genus. Both species are known only from New Zealand.

Coelopa anomala Cole, 1923, California Acad. Sci., Proc. **12**: 470 (California). The genotype and only known species of *Coelopina* Malloch (loc. cit.). *Chaetocoelopa* and *Coelopina* differ from *Coelopa* by having the metasternum bare and mesopleura setulose, plus other details.

Coelopa debilis Lamb, 1909, Sub-Antarctic Islands of New Zealand **1**: 140 (Campbell Island) and *C. nigrifrons* Lamb, 1909, loc. cit. (Macquarie Islands). *Coelopa rufa* Hutton, 1901, New Zealand Inst., Trans. **34**: 173 (New Zealand). Cannot be placed from the very brief descriptions.

Coelopa glabra Walker, 1849, List Dipt. Ins. Brit. Mus. **1** (4): 1134, is a synonym of *Hydromyza livens* Fabricius (see Collin, 1910, Ent. Monthly Mag. **46**: 48).

The following is the only species from Micronesia.

1. Coelopa (Coelopa) palauensis Hardy, n. sp. (fig. 1, *a-f*).

Male. Predominantly brown to black in ground color, densely gray pollinose; lower face, lower genae, oral margin, palpi, and antennae rufous, tinged lightly with brown. Outer vertical bristles are at same level as inner ones and distance between the two is equal to that between ocellar bristles. Three rather strong fronto-orbital bristles are present, lowest pair slightly below middle of front. Numerous small setae are situated in fronto-

orbital row and scattered over front, especially lower two-thirds. Third antennal segment is brown around margin and about as wide as long (fig. 1, *a*). Arista is bare. Genae are densely covered with elongate black hairs about the same length and density as those on femora. *Thorax:* Largely black in ground color, densely gray pollinose, humeri and propleura red. Mesonotum evenly pollinose, with no indications of vittae. Following pairs of bristles are present: One moderate-sized propleural; one larger sternopleural; one humeral; two notopleural; one presutural; one supra-alar; two postalar; one prescutellar acrostical; and two scutellars, the inner pair crossed. Halteres yellow tinged with red at their bases. *Wings:* Hyaline, costa and veins yellow. Setae making up costal fringe are closely placed and short, about equal to or slightly less than diameter of costa. Third section of costa (between apices of veins R_1 and R_{2+3}) is about one-third as long as second section. Vein

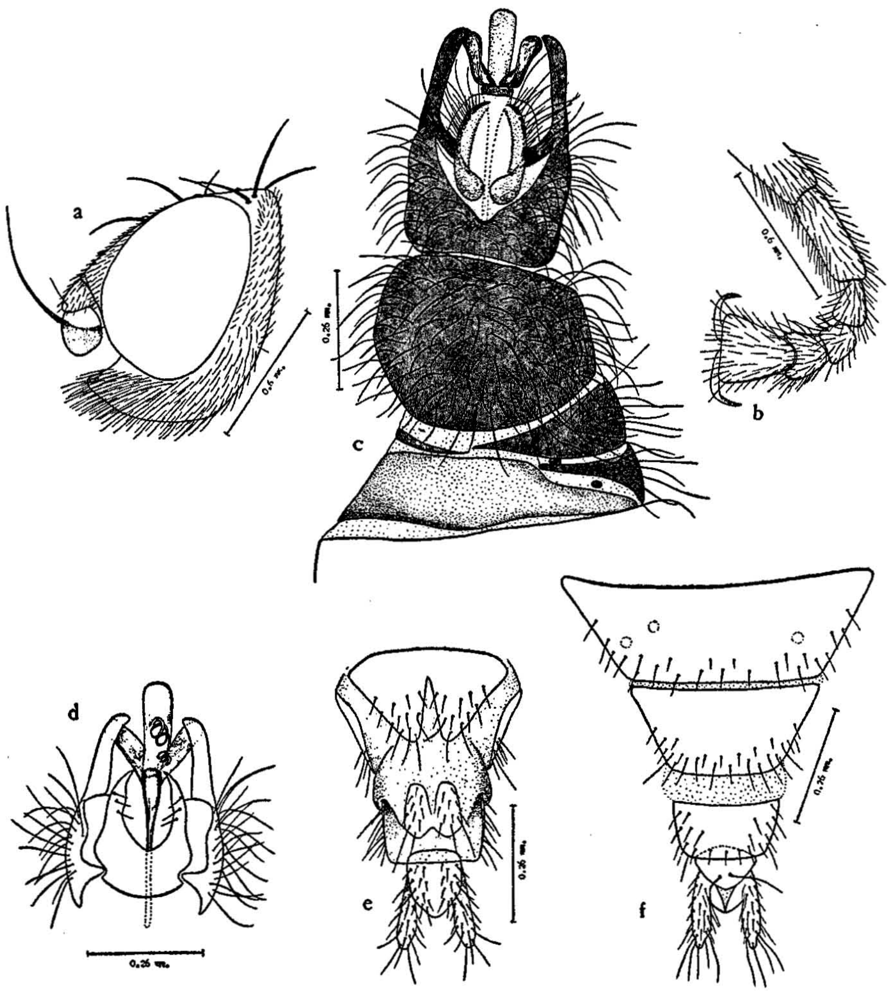


FIGURE 1.—**a,** head, lateral; **b,** front tarsus of male; **c,** apex of male abdomen, dorsal; **d,** male genitalia, ventral; **e,** female genitalia, ventral; **f,** female genitalia, dorsal.

R_{2+3} ends just slightly before a point opposite r-m cross vein. The r-m cross vein is situated slightly beyond middle of the distance from base of vein R_{4+5} to m cross vein. Cell R_5 is broadest at a point opposite m cross vein and narrows slightly at wing tip. Vein M_{3+4} evanesces just before wing margin. Basal section of vein Cu_1 is oblique, so that cell Cu is pointed at lower apex. *Legs:* Largely red, slightly brownish at apices of femora and apical portions of front tibiae. All segments, especially tibiae and femora, densely covered with long black hair. Apical three tarsal segments rather strongly flattened (fig. 1, *b*). Empodium consists of a moderately long curved yellow hair having several dorsal branches near its base. Pulvilli are about as long as wide and are very densely white pilose. Middle tibiae with five moderately strong black spines at apex and two smaller subapical spines on venter. Hind tibiae each with two black spines at apex below, one rather long and curved, and hind basitarsi with five black spines in a row down apical two-thirds of venter. *Abdomen:* Largely red with hind margin of third tergum and nearly all of fourth blackened; also with a fine black vitta extending down middle of terga one to three. Densely brown- to black-haired, especially on sides and posterior portion. *Genitalia:* Largely red tinged with brown, densely black-haired. Claspers (dististyli) slender, nearly parallel-sided, and blunt at apices. Ninth sternum surrounds aedeagus, is deeply cleft on hind margin. From ventral view, posterior lateral margins are developed into slender pointed lobes which extend alongside basal portion of aedeagus and come together on dorsum of aedeagus (fig. 1, *c*). Aedeagus complexly developed, consisting of slender, elongate basal portion, an expanded lightly sclerotized apical portion with the coiled, ribbonlike penis arising from near middle on venter and a pair of fingerlike parameres arising from base of apical portion and extending obliquely beneath tips of claspers (fig. 1, *d*).

Length of type: body, 4.7 mm.; wings, 3.8 mm.

One of male paratypes measures only 3.0 mm. in body length; wing, 2.4 mm. It is much more sparsely haired and vestiture is not so long and fine as in typical specimens.

Female. Female on hand is an undersized specimen, it fits all of the characteristics of male except for genital characters and except for greatly reduced vestiture of body and legs. In this respect it is like the small male noted above; compared to type it is rather sparsely covered with shorter less villose hair. Also vein R_{4+5} ends distinctly beyond r-m cross vein. Seventh sternum has a V-shaped cleft extending half its length on hind margin, and eighth sternum has a narrow cleft extending down middle, two-thirds its length, from anterior margin (fig. 1, *e*). Three tiny round spermathecae are present. Cerci are rather long and slender (fig. 1, *f*).

Length: body, 3.0 mm.; wings, 2.5 mm.

Holotype male (BISHOP 2375) and allotype female from Ngurukdabel (Urukthapel) I., Palau Is., western Carolines, Sept. 13, 1953, J. W. Beardsley; the allotype is labeled "ex *Messerschmitia*." Also two male paratypes, one as normal in size and vestiture as the type, and one undersized specimen, from Ulimang, Babelthuap I., Palau Is., Dec. 14-19, 1947, at light, H. S. Dybas.

Type and allotype in Bishop Museum, the two paratypes in the United States National Museum and Chicago Natural History Museum.

DISTRIBUTION: Western Caroline Is. (Palau).

C. palauensis does not seem to fit near any of the known species. It appears related to the genotype, *Coelopa pilipes* Haliday, in the presence of presutural bristles, but it differs in the lack of setae at the base of the radial vein as well as in other details. It is somewhat like *C. macquariensis* Womersley, from the subantarctic, but that species lacks presutural bristles, has the third antennal segment attenuated, is about two times longer than wide, has dark vittae on the mesonotum, and has other differences.